ZINC OXIDE THIN FILMS FOR ULTRAVIOLET RADIATION DETECTION

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Abstract

Zinc Oxide (ZnO) thin films are of great interest due to their interesting properties and useful applications such as gas sensors1, blue and ultraviolet (UV) lasers and piezoelectric, photoconducting and optical waveguide materials2. Our particular interest in them is due to their response to the optical radiation mainly in the UV region. Zinc Oxide is a II-VI wide band gap (~3.3 eV) semiconductor with a binding energy of 60 MeV. We have prepared 0.9 to 1.0 micron thick zinc oxide films using metalorganic decomposition (MOD), a very inexpensive and versatile spin coating method. Zinc II-Ethylhexanoate is dispensed onto sapphire substrates, which are then spun at 3000 rpm for 10 seconds, and heated in air at 400-450°C for 90 seconds. This procedure is repeated several times in order to attain the required thickness; 5 coats corresponded to ~300 nm. Samples were further annealed in air at 550°C for 1 hour. The X-ray diffraction and Raman Spectra of the films indicate that the films are of wurtzite polycrystalline structure. Optical transmission measurements performed using a Perking-Elmer Lambda 900 dual beam UV/VIS spectrometer reveal that the films have a bandgap energy of 3.3 eV, which corresponds to ultraviolet region and that holds promise for UV detection. We are currently in the process of investigating the electrical responses of the films when exposed to UV radiation. Further studies performed on the structural, optical, and electrical properties of these ZnO films, as well as their prospects in the field of ultraviolet detection will be presented.

1 J.N. Zeng, et al. Applied Surface Science 197-198 (2002) 362-367 2 L.Znaidi, et al. Thin Solid Films 248 (2003) 257-2626

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